

EVALUATION OF SOUTHERN PINE BEETLE INFESTATIONS ON THE
ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION
RESERVATION, OAK RIDGE, TENNESSEE

By

J. H. Thompson^{1/} and D. Bradburn^{2/}

INTRODUCTION

The Energy Research and Development Administration Oak Ridge Reservation is located in the Tennessee River Valley adjacent to the Cumberland Plateau in eastern Tennessee (Figure 1). The Reservation is federally owned and is managed by the Union Carbide Corporation primarily for nuclear energy production and energy research. The forested land is managed for sustained yield timber production and serves as a research area for the Environmental Sciences Division of the Holifield National Laboratory.

A southern pine beetle infestation occurred on the Reservation from 1964 to 1966 during which time 200,000 trees were killed. The beetle population then remained relatively low until 1973 when the current outbreak reached serious proportions. Control projects have been conducted during fiscal years 1974 and 1975.

Continuing beetle activity indicated the need for this evaluation to determine whether further control efforts are biologically justified.

METHODS

Standard aerial sketchmap and ground check techniques were utilized during the evaluation.^{3/} A 100-percent aerial sketchmap survey was made over the 37,000 acres of the ERDA Oak Ridge Reservation on June 12, 1975.

^{1/} Group Leader, U. S. Forest Service, S&PF, Asheville, N. C.

^{2/} Forester, ERDA Oak Ridge Reservation, Oak Ridge, Tenn.

^{3/} Detection of Forest Pests in the Southeast, 1970, USDA, USFS, SA, S&PF Pub. S&PF-7, Atlanta, Ga. 51 pp.

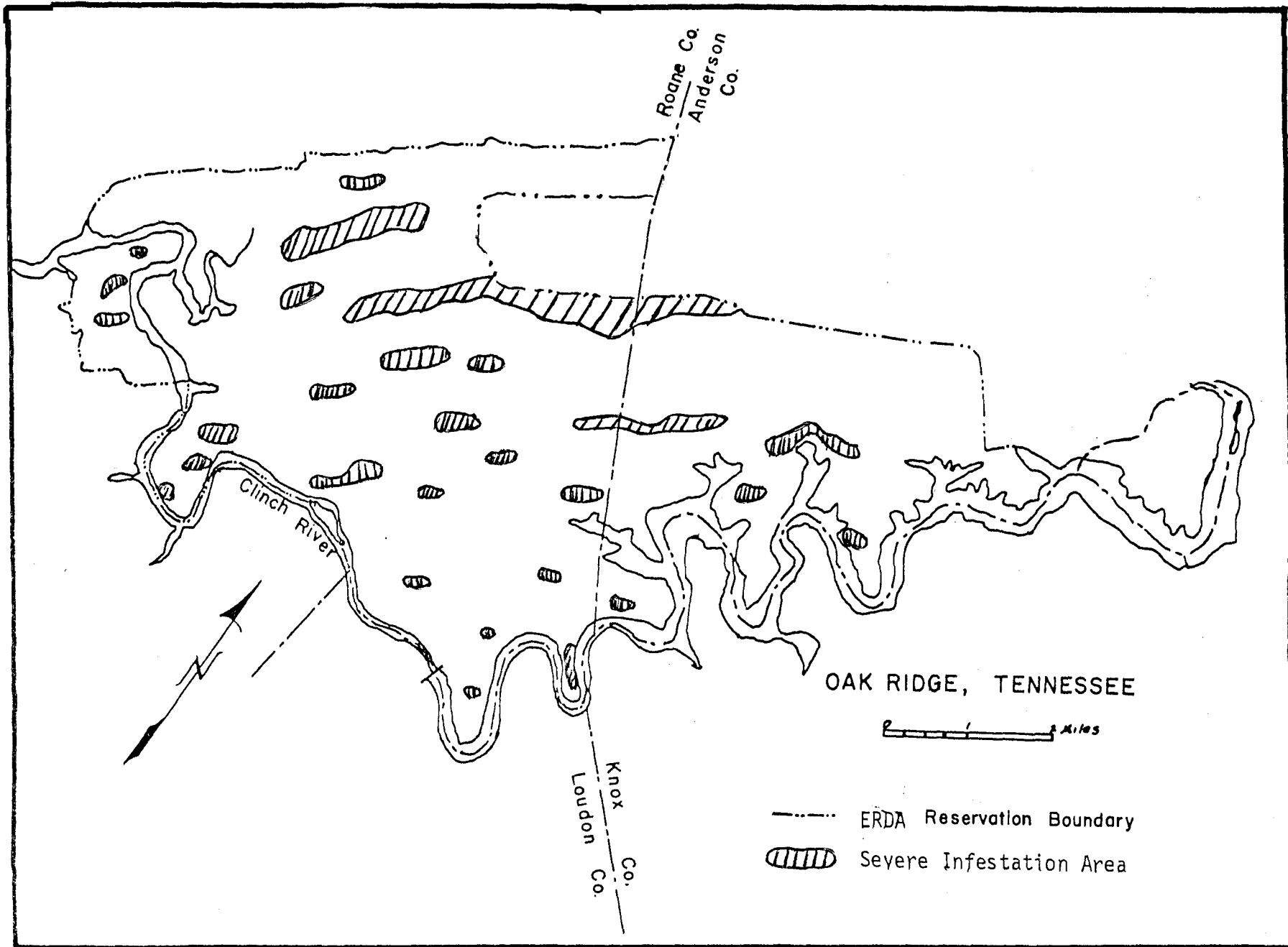


Figure 1. Southern pine beetle evaluation area - ERDA Reservation, Oak Ridge, Tennessee.

Six representative beetle spots were ground checked throughout the most heavily infested portion of the Reservation on August 18 and 19. This was to confirm the identity of the causal agent, to determine the current population trend and to check the status of natural control agents.

TECHNICAL INFORMATION

Insect - Southern pine beetle, *Dendroctonus frontalis* Zimm.

Hosts - Shortleaf, loblolly, and Virginia pines occur on the Reservation. All are being attacked.

Type of Damage - Death of the tree is the result of cambial mining by the southern pine beetle. The insect also introduces blue stain fungi, *Ceratocystis* spp., which reduce or block water conduction in the stem.

Life Cycle of the Beetle - The beetles attack in pairs constructing winding galleries in the cambium. Eggs are deposited in niches along the sides of the galleries. The eggs hatch into whitish grubs that further mine the cambium and then construct cells in the bark for pupation. The callow adults then mine through the bark to emerge. The complete life cycle takes about a month during the summer and as many as seven generations may be produced in a year.

RESULTS

Results of the aerial sketchmap phase of the evaluation are summarized in Table 1. A total of 262 spots contained over 6,300 red-topped and fading trees. The ratio of green infested trees to red tops and faders is 1:2. Approximately 8,040 standing trees, dead and alive, are affected. Beetles are developing and completing the life cycle rapidly; the insects have completely emerged from most faders and from some green trees.

Secondary insects and predators are not abundant; natural control agents are apparently at low levels.

Table 1. Results of June 1975 Aerial Survey - ERDA Oak Ridge Reservation^{4/}

Infestation Size (No. of Trees)									
2-5		6-20		21-50		Over 50		Total	
Spots	Trees	Spots	Trees	Spots	Trees	Spots	Trees	Spots	Trees
100	458	119	1634	26	1040	17	3200	262	6332

^{4/} Corrected according to data by Aldrich et. al. (1958)

DISCUSSION AND RECOMMENDATIONS

The intensity of the southern pine beetle outbreak on the ERDA Oak Ridge Reservation is continuing at a high level. Indications are that this trend will likely continue through the year.

The Forest Management Group, Environmental Sciences Division, has carried a very aggressive control project in the past year. A total of 3,882 cords of pulpwood and 595 MBF of sawtimber has been salvaged. Where beetle spots are inaccessible to logging, infested trees are unmerchantable and infested debris is left from salvage, the infested material is bulldozed into piles and burned. It has been found particularly necessary to burn the tops of salvaged shortleaf pines to prevent spot breakouts.

These control efforts have undoubtedly had a substantial influence on the severity of the outbreak. Continued aggressive control action will maintain the beetle population at the lowest level possible. Southern pine beetle control techniques recommended in the Forest Service Manual are as follows:

1. Removal of Infested Trees by Commercial Sale or Administrative Use. When infested trees of merchantable size are accessible, they should be removed by commercial sale or administrative use procedures. Logging of the infested material should begin immediately. Contract time limits should insure rapid removal.

Where practical, and if host type is present, a 40- to 70-foot buffer strip should be marked and cut adjacent to and ahead of the most recently infested trees. This practice is effective in reducing the possibility of "breakouts". When only a small volume of infested merchantable material occurs in a spot, non-infested trees surrounding the spot may be marked to provide an operable cut.

The order of priority for removing beetle infested timber from a spot should be as follows:

Trees having nearly developed broods. (Usually the red and fading trees.)

Trees having young broods. (Usually the green, recently infested trees.)

Trees in the buffer zone.

2. Piling and Burning. Unmerchantable or inaccessible southern pine beetle infestations can be suppressed by cutting, piling, and thoroughly burning the bark of infested trees. The entire bark surface must be thoroughly burned to insure effective control.

The order of priority for cutting, piling, and burning infested trees, particularly in large spots, is the same as paragraph (1) under removal of infested trees by commercial sale or administrative use. Cutting a buffer strip is not recommended. To reduce the possibility of "breakouts" every effort should be made to locate and treat all green infested trees during the piling and burning operation.

3. Chemical Control. Chemical formulation recommended for southern pine beetle control is a 1/2 percent Lindane spray with No. 2 fuel oil as the carrier. This may be formulated from a 20 percent Lindane emulsifiable concentrate or oil concentrate at the rate of 11 pints of concentrate in enough fuel oil to make 55 gallons of spray. (Ratio of one part 20 percent Lindane EC to 39 parts No. 2 diesel fuel.)

Cut, limb and buck all infested trees into workable lengths. Spray the infested bark surface to the point of run-off. A compressed air sprayer (3-gallon capacity or equivalent) is an ideal applicator. Infested logs must be turned two or three times to insure complete treatment of infested bark. Spray stumps and bark removed by woodpeckers. Low pressure sprayers may be used to treat large, accessible infestations.

The order of priority for cutting and spraying infested trees in large spots is the same as paragraph (1) under removal of infested trees by commercial sale or administrative use. Cutting a buffer strip is not recommended. To reduce the possibility of "breakouts" every effort should be made to locate and treat all green infested trees during the chemical control operation.

Never spray trees from which southern pine beetle brood has emerged. Natural enemies of the southern pine beetle in these trees can then complete their development. To prevent aerial spotters from mapping treated spots cut trees with red needles from which beetles have emerged.

Instructions for minimizing the adverse effects of mixing, transporting and storing pesticides, applying pesticides and disposing of pesticide containers and excess chemicals are outlined in section 8.3 of the Forest Service Health and Safety Code and FSM 5242.21. Detailed safety procedures should be outlined in the project suppression plan.

4. Reexamination of Treated Areas. Reexamine areas where infested trees were removed by commercial sales, piled and burned or chemically treated within two or three weeks after treatment to check for additional infested trees. If additional trees are found, treat them.

No chemical control is anticipated in this proposed project.